

AMENDMENTS TO THE CLAIMS

This listing of claims will replace all prior versions and listings of claims in the application:

LISTING OF CLAIMS:

1. (currently amended): An array antenna transceiver for performing broadband transmission by a multicarrier, comprising:

means for grouping all subcarriers into a plurality of subcarrier groups; and

means for calibrating a transmission route for each group,

wherein said means for calibrating a transmission route includes:

a plurality of calibration signal demodulating means for demodulating a transmission route number and subcarrier number for calibration of a transmission route and outputting the demodulation results,

demodulation result processing means for outputting a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) by receiving demodulation results of calibration signals output from the calibration signal demodulating means and outputting calculated calibration coefficients by receiving demodulation results of calibration signals output from said calibration signal demodulating means,

demodulation symbol area determining means for determining an area to which each demodulation result belongs on a previously divided I/Q coordinate plane by receiving a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) output from said demodulation result processing means and outputting the determination result,

calibration subcarrier selecting means for selecting one transmission route number and subcarrier number closest to the medium value in a area out of demodulation symbol point (phase/amplitude information) group classified every area output from said demodulation symbol area determining means and outputting the determination results.

calibration control means for outputting a transmission route number and subcarrier number selected every area output from said calibration subcarrier selecting means and outputting a calibration mode change signal for changing calibration modes, and

transmission baseband processing means for setting calibration coefficients of all subcarriers in all transmission routes by receiving calibration coefficients output from said demodulation result processing means and a transmission route number and subcarrier number classified into the same area output from calibration coefficients and generating a calibration signal in accordance with a calibration mode change signal supplied from said calibration control means, a transmission route to be calibrated, and subcarrier information.

2. (canceled).

3. (currently amended): The array antenna transceiver according to claim 2~~1~~, wherein subcarriers having phase/amplitude characteristics hardly different each other are grouped in accordance with demodulation results of all subcarriers in all transmission routes independently of the same transmission route or different transmission routes.

4. (original): The array antenna transceiver according to claim 3, wherein a calibration coefficient is calculated only for one subcarrier in the same group and the obtained

calibration coefficient is set as a calibration coefficient common to all subcarrier groups belonging to the same group.

5. (original): The array antenna transceiver according to claim 3, wherein a subcarrier having a demodulation symbol point closest to the center in an area in a subcarrier group belonging to the same group is selected as “a subcarrier for calibration”.

6. (original): The array antenna transceiver according to claim 3, wherein calibration of all subcarriers in all transmission routes to be grouped is performed in a long cycle and calibration of the subcarriers in the grouped transmission routes is performed in a short cycle.

7. (original): The array antenna transceiver according to claim 3, wherein a calibration accuracy can be adjusted by changing the number of divided areas to be grouped.

8. (original): The array antenna transceiver according to claim 1, wherein said means for calibrating a transmission route includes;

a plurality of calibration signal demodulating means for demodulating a transmission route number and subcarrier number for calibration of a transmission route and outputting the demodulation results,

demodulation result processing means for outputting a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) by receiving demodulation results of calibration signals from the calibration signal demodulating

means and outputting calculated calibration coefficients by receiving demodulation results of calibration signals output from said calibration signal demodulating means,

demodulation symbol group selecting means for outputting a demodulation symbol point, transmission route number, and subcarrier number of the same group by receiving a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) output from said demodulation result processing means and thereby deciding the same symbol point group in accordance with dispersion of demodulation symbol points of demodulation results,

calibration subcarrier selecting means for selecting one transmission route number and subcarrier number closest to the medium value in a group out of a demodulation symbol point (phase/amplitude information) group classified every group output from said demodulation symbol group selecting means and outputting the determination results,

calibration control means for outputting a transmission route number and subcarrier number selected every group output from the calibration subcarrier selecting means and outputting a calibration mode change signal for changing calibration modes, and

transmission baseband processing means for generating a calibration signal by receiving a calibration coefficient output from said demodulation result processing means and a transmission route number and subcarrier number classified into the same group output from said demodulation symbol group selecting means and thereby setting calibration coefficients of all subcarriers in all transmission routes and moreover in accordance with a calibration mode change signal supplied from said calibration control means, a transmission route to be calibrated, and subcarrier information.

9. (original): The array antenna transceiver according to claim 8, wherein calibration for grouping all subcarriers in all transmission routes is performed in accordance with temperature information of the transceiver.

10. (currently amended): The array antenna transceiver according to claim 21, wherein subcarriers in the same group are combined and then a calibration coefficient is added to reduce the number of adding circuits.

11. (currently amended): An array antenna transceiver according to claim 21, wherein neighbor subcarrier groups in which components in a transmission route have a similar frequency characteristic (phase/amplitude) are grouped in a frequency direction to apply a common calibration coefficient.

12. (currently amended): A method of calibrating a transmission route using an array antenna transceiver for performing wide-band transmission by a multicarrier, comprising:
a step of grouping all subcarriers into a plurality of subcarrier groups and calibrating a transmission route for each group,

wherein said step of calibrating a transmission route includes:

a calibration signal demodulating step of demodulating a transmission route number and subcarrier number for calibration of a transmission route and outputting the demodulation result;
demodulation result processing step of outputting a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) by receiving a demodulation result of a calibration signal output from said calibration signal demodulation

step and outputting a calculated calibration coefficient by receiving a demodulation result of a calibration signal output from said calibration signal demodulating step,

a demodulation symbol area determining step of determining an area to which each demodulation result belongs on a previously divided I/Q coordinate plane and outputting the determination result by receiving a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) from the demodulation result processing step,

a calibration subcarrier selecting step of selecting one transmission route number and subcarrier number closest to the medium value in an area output from the demodulation symbol area determining step out of demodulation symbol point (phase/amplitude information) groups classified every area output from said demodulation symbol area determining step and outputting the selection results,

a calibration control step of outputting a transmission route number and subcarrier number selected every area output from said calibration subcarrier selecting step and changing calibration modes, and

a transmission baseband processing step of setting calibration coefficients of all subcarriers in all transmission routes and moreover generating a calibration signal in accordance with a calibration mode change signal supplied from said calibration control step, a transmission route to be calibrated, and subcarrier information by receiving a calibration coefficient output from the demodulation result processing step and a transmission route number and subcarrier number classified into the same area output from said demodulation symbol area determining means.

13. (canceled).

14. (currently amended): The transmission route calibrating method according to claim 12~~13~~, wherein subcarriers having phase/amplitude characteristics hardly different each other are grouped in accordance with demodulation results of all subcarriers in all transmission routes independently of the same transmission route or different transmission routes.

15. (original): The transmission route calibrating method according to claim 14, wherein a calibration coefficient is calculated only for one subcarrier in the same group and the obtained calibration coefficient is set as a calibration coefficient common to all subcarrier groups belonging to the same group.

16. (original): The transmission route calibrating method according to claim 14, wherein a subcarrier having a closest demodulation symbol point closest to the center in an area in a subcarrier group belonging to the same group is selected as “a subcarrier for calibration”.

17. (original): The transmission route calibrating method according to claim 14, wherein calibration of all subcarriers in all transmission routes to be grouped is performed in a long cycle and calibration of the subcarriers in the grouped transmission routes is performed in a short cycle.

18. (original): The transmission route calibrating method according to claim 14, wherein a calibration accuracy can be adjusted by changing the number of divided areas to be grouped.

19. (original): The transmission route calibrating method according to claim 12, wherein the step of calibrating a transmission route includes;

a calibration signal demodulating step of demodulating a transmission route number and subcarrier number for calibration of a transmission route and outputting the demodulation results,

a demodulation result processing step of outputting a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) by receiving a demodulation result of a calibration signal output from said calibration signal demodulation step and moreover outputting a calculated calibration coefficient by receiving a demodulation result of a calibration signal output from each of the calibration signal demodulating means,

a demodulation symbol group selecting step of deciding the same symbol point group in accordance with the dispersion of demodulation symbol points of demodulation results by receiving a transmission route number, subcarrier number, and normalized demodulation symbol point (phase/amplitude information) output from said demodulation result processing step and outputting a demodulation symbol point, transmission route number, and subcarrier number of the same group,

a calibration subcarrier selecting step of selecting one transmission route number and subcarrier number closest to the medium value in a group out of a demodulation symbol point

(phase/amplitude information) groups classified every group output from the demodulation symbol group selecting step and outputting the determination results,

a calibration control step of outputting a transmission route number and subcarrier number selected every group output from the calibration subcarrier selecting step and moreover outputting a calibration mode change signal for changing calibration modes, and

a transmission baseband processing step of setting calibration coefficients of all subcarriers in all transmission routes by receiving a calibration coefficient output from said demodulation result processing step and a transmission route number and subcarrier number classified into the same group output from said demodulation symbol group selecting step and generating a calibration signal in accordance with a calibration mode change signal supplied from said calibration control step, a transmission route to be calibrated, and subcarrier information.

20. (original): The transmission route calibrating method according to claim 19, wherein calibration for grouping all subcarriers in all transmission routes is executed in accordance with the temperature information of the transceiver.

21. (currently amended): The transmission route calibrating method according to claim ~~13~~12, wherein a calibration coefficient is added after synthesizing subcarriers in the same group to reduce the number of adding circuits.

22. (currently amended): The method of calibrating a transmission route used by an array antenna transceiver for performing broadband transmission by a multicarrier according to claim ~~13~~12, wherein

neighbor subcarrier groups in which components in a transmission route have a similar frequency characteristic (phase/amplitude) are grouped in a frequency direction to apply a common calibration coefficient.

23. (canceled).

24. (canceled).

25. (previously presented): The array antenna transceiver according to claim 1, wherein the means for grouping all subcarriers into a plurality of subcarrier groups further comprises:

means for detecting demodulation symbol points of all subcarriers in all transmission routes and classifying the demodulation symbol points in accordance to preset groups.